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B24D

(54) Abrasive polishing element

(57) A polishing element 1 comprises a main body 2 with a plurality of abrasive teeth or particles 3 provided on the frontal surface thereof. A spiral of eight see-through holes 4 are provided through the main body 2 so that when the disk is rotated by a tool, the after image from each hole contributes to forming an integrated image of the surface which is being polished. Thus, it is unnecessary to remove the polishing element 1 from the object being polished to allow viewing of the surface thereof. At the same time, the holes 4 allow removal of the abraded material reducing thereby clogging and also promoting circulation of air to the polished surface thereby cooling the object and polishing element.

FIG. 1

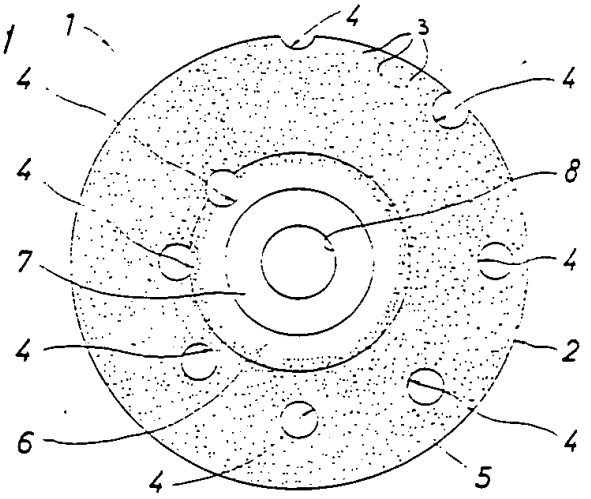

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FIG. 1

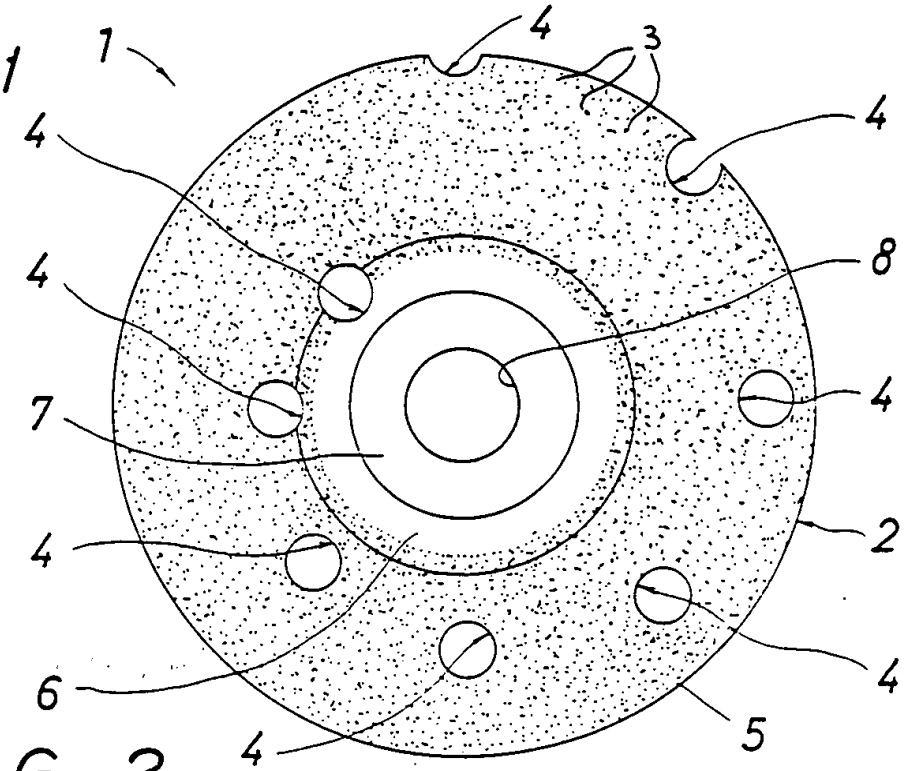


FIG. 2

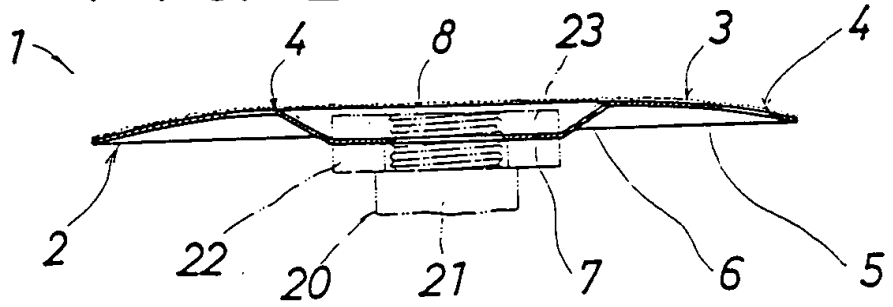


FIG. 3

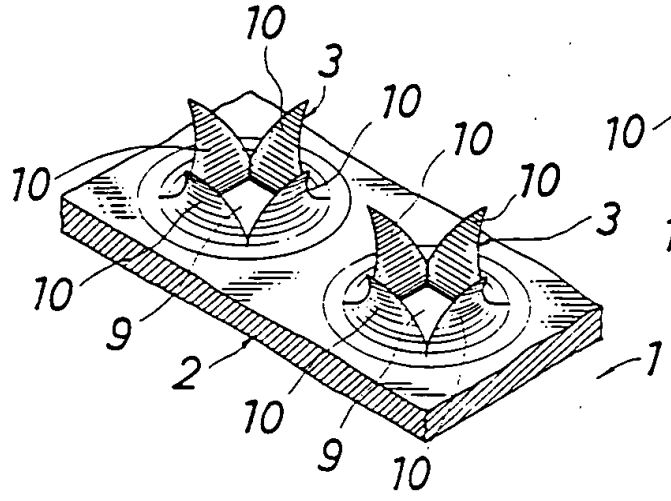
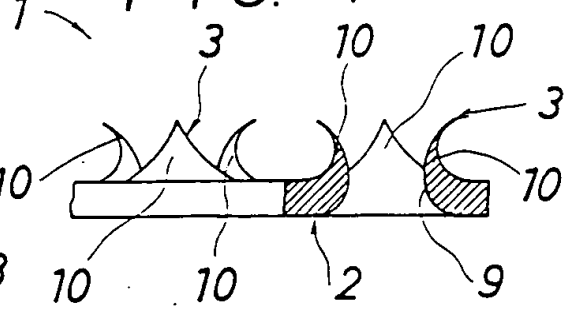


FIG. 4



POLISHING ELEMENT

This invention relates to a polishing element having an abrasive frontal surface for abrasive polishing.

Hard polishing elements have typically employed files, sandpaper, emery cloth, wetstone, and metal polishes such as disclosed in Japanese patent publication 60-17648.

Other polishing elements, particularly mechaninsed ones used by robots, are based on the afore mentioned polishing elements. In such circumstances, where automation has taken over, it is important to inspect the work done. However, it is time consuming and in some circumstances difficult to move the polishing tool away from the object to be polished in order to check the state of polishing. Indeed, as the final polishing is carried out, the frequency of examination must normally be increased. At the same time, many polishing elements become warm during the polishing action to a point where the abrasive quality of the

element reduces since the action thereof becomes less abrasive and more smearing. Finally, the polishing elements can tend to collect abraded material between the polishing surface and the object to be polished which may lead to clogging of the abrasive element with abraded material.

It is an object of the present invention to provide a polishing element having an abrasive frontal surface wherein the polishing element does not need to be removed from the object to be polished in order to enable viewing of the surface being polished. At the same time, it is an object to provide a polishing element wherein clogging of the abrasive frontal surface is reduced and cooling of the abrasive surface is enhanced.

According to the present invention there is provided a polishing element comprising a main body of metal plate having an abrasive frontal surface and see-through holes opened at places through said main body. Thus, although the polishing element itself is not transparent, the provision of the holes through the main body allows viewing of the object being

polished without removal of the polishing element itself. Indeed, when the movement of the polishing element relative to the object being polished is stopped or speeded up, the polished surface becomes visible from the rear side of the main body through the see-through holes. Thus, the polishing element of the invention permits a user to examine the polished surface without the need of frequently removing the polished element away from the object.

At the same time, abraded material from the abrading process passes backwardly through the see-through holes so that the polishing element is less likely to become clogged with abrasive material. Furthermore, the see-through holes promote circulation of air between the frontal surface and the polished surface thereby having a cooling effect. In addition, the weight of the polishing element is reduced compared with a solid metal plate polishing element.

Preferably, the metal plate is circular in shape and consists of a generally flat central disc portion and an outer annular portion having a curved cross-section. The metal plate can also include an

annular connecting portion interposed between the outer annular portions and central disc portion. As a result, objects are polished with satisfactory results by virtue of the abrasive on the curved section. The curve also prevents problems in polishing, such as when the periphery of the main body with abrasive thereon jams against the object being polished.

Preferably the see-through holes form a sequential spiral from adjacent the central portion to the outer edge of the outer portion. In this way, the after image from each see-through hole gained by rotation of the plate contributes to forming an integrated image of the object of polishing. Preferably, there are eight holes, each hole being provided at an angle of 45 degrees around the plate axis and disposed at equal step distances from the centre of the plate.

Examples of the present invention will now be described with reference to the accompanying drawings, in which:-

Fig.1 illustrates the abrasive frontal surface of a polishing element embodying the present invention.

Fig.2 illustrates a cross-sectional view through the element shown in Fig.1.

Fig.3 illustrates an enlarged perspective view illustrating abrasive teeth on the frontal surface of a polishing element embodying the present invention.

Fig.4 illustrates a cross-section through the teeth shown in Fig.3.

Referring to the drawing, a polishing element comprises essentially a main body metal plate 2 having an abrasive frontal surface formed in the present example, from a plurality of teeth 3. As can be seen from Fig.2, the metal plate of the main body 2 is a circular sheet having an outer annular portion 5 with a curved cross-section for use as a revolving tool. This section extends inwardly to a connecting annular portion 6 which is recessed relative to the curvature of the annular portion 5 and extends inwardly to a central disc portion 7 which is a generally flat

planet disk having a fixing opening 8 at its centre. In the example, the main body 2 has a plat thickness of approximately 0.5mm, an oval diameter of approximately 100mm, and a overall depth of approximately 5mm. The opening 8 in the centre has a diameter of approximately 16mm.

The main body 2 has a plurality of see-through holes 4 protruding through the body as illustrated. In the example, eight such holes are provided at points which form 45 degree angles about the axis of the body 2 and the holes are spaced in equal distance steps from the centre of the body in sequential order. Thus, a spiral pattern is formed. Each see-through hole 4 preferably has a diameter of approximately 8mm. With the see-through holes 4 arranged on a spiral path, each after image that is gained by the rotation of the main body 2 contributes to forming an integrated image of the object after polishing.

The abrasive teeth 3 comprise protrusions raised in a large number from the surface of the main body 2. As illustrated in Fig.3 and 4, each tooth consists of a hole 9 opened through the main body 2 in a manner to

form four tooth-like elements 10 which, as part of the main body 2, are raised from it frontally and along the sides of the hole 9. Each tooth element 10 is positioned at an angle of substantially 90 degrees from each adjoining tooth element and is bent over at an acute angle of approximately 135 degrees relative to the main body. A large number of such teeth are formed on the frontal surface of the curved section 5 and on part of the connecting section 6.

As an example, the square hole 9 of each tooth has four sides each of which measures approximately 1.1mm, each tooth element 10 has a height of approximately 0.9mm, and the tips of any two tooth elements 10 positioned opposite to each other are apart from each other with a distance of 2mm in between.

A polishing element of the present invention can be produced by first subjecting a steel plate with a thickness of approximately 0.5mm to press purchasing to form teeth 3 between punches and dyes. Thereafter, another press can shape the cross-section of the main body and the central opening 8 and see-through holes 4 can then be stamped therefrom. In order to protect

the main body 2 from damage during its shaping, it is preferable that application of an elastic material such as rubber is applied to the dye surface on the side of the teeth.

Referring to Fig.2, in operation, a polishing element 1 is mounted by a fixing means 22 to a shaft 21 of an electric portable grinder 20. When power is applied, an object of polishing is abrasively polished as the teeth 3 covering the main body are applied to the object. The polishing can be done by virtue of the gradual backward curve of the main body 2 at positions close to the periphery where a large number of teeth are provided. While the polishing element 1 is rotating, a sequence of after images of the polished surface is gained through the see-through holes 4 to form an integrated image of the polished surface which can be be inspected either by a user or some form of automation. Needless to say, the polished surface can be seen through the holes 4 when the polishing element 1 is not rotating.

Consequently, the polishing element 1 of the present invention permits the user to examine the polishing surface without the trouble of frequently removing the polishing element away from the object being polished. Furthermore, abraded material from the polishing process is not only removed along the surface of the polishing element but can also pass through the see-through holes 4 thereby reducing the likelihood of clogging the teeth 3. At the same time, the see-through holes 4 provide ventilation to the polishing surface and the abrasive teeth 3 thereby cooling and reducing the likelihood of smearing on the surface of the polished surface.

As will be apparent to the person skilled in the art, the present invention is not restricted to the embodyment illustrated. For example, the connecting portion 6 can be eliminated so that the curved portion 5 jointly joins the flat disc portion 7. In addition, although the element is shown as a circular disk, other suitable shapes for a polishing element can be provided, for example for a manually operated tool, the polishing element may be rectangular or triangular in shape. It will be apparent that where the

polishing element is attached to the tool, it is important that the see-through holes 4 are not blocked to prevent viewing of the polished surface.

Finally, whereas the teeth 3 are illustrated as in Figs. 3 and 4, the teeth can in fact be mushroom like protrusions as made public in Japan Patent publication 60-17648 or each of the teeth can be replaced by abrasive particles adhesively adhered to the surface of the main body 2. The see-through holes 4 are illustrated in the present invention as being circular holes, although they can comprise oblong holes instead. The main body 2 can also be heat treated in practice or can be quenched to harden the surface layer only or the entire material. The hardened layer or the hardened material can also be coated with a synthetic resin. The coating which comes in contact with an object of polishing is removed in polishing.

CLAIMS

1. A polishing element comprising a main body of metal plate having an abrasive frontal surface and see-through holes opened at places through said main body.

2. An element as claimed in claim 1 wherein said metal plate is circular in shape and consists of a generally flat central disc portion and an outer annular portion having a curved cross section.

3. An element as claimed in Claim 2 wherein an annular interconnecting portion is interposed between the outer portion and disc portion.

4. An element as claimed in Claim 2 or 3 wherein a priority of see-through holes are provided in a spiral form extending in sequential order from adjacent the central portion the plate periphery.

5. An element as claimed in Claim 4 wherein eight holes are provided at 45 degree angles around the plate access.

6. An element as claimed in the Claim 1 whereas the metal plate is substantially rectangular in shape.

7. An element as claimed in claim 1 wherein said metal plate is substantially triangular in shape.

8. An element as claimed in any preceding claim wherein said see-through holes are circular in shape.

9. An element as claimed in any one of claim 1 to 7 wherein said see-through holes are elongate in shape.

10. An element as claimed in any preceding claim wherin said abrasive frontal surface is provided by a plurality of teeth, each tooth consisting of a through hole and tooth element.

11. An element as claimed in any one of claims 1 to 9 wherin said abrasive frontal surface consists of a

plurality of teeth, each tooth consisting of mushroom like pertrusions integrally formed on the main body.

12. An element as claimed in any one of Claims 1 to 9 wherein said abrasive frontal surfaces is provided by a plurality of abrasive particles adhesively fixed to the main body.

13. A polishing element substantially and herein described with reference to the accompanying drawings.

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